

MISCELLANEOUS NOTES

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9. MICROSCOPIC IDENTIFICATION OF FEATHERS AIDING BIRD HAZARD PREVENTION PROGRAMME IN INDIA

(With two plates)

The Bombay Natural History Society has since 1966, been receiving for identification, remnants of birds involved in bird-strike incidents in the Indian Air Force. The bird remnants sent are usually feathers picked up from the site of impact. Whenever the bird remnants were intact, such as a large complete feather, head or a foot, the species was conclusively identified while at other times, such as when the feathers were fragmentary or disfigured, the bird species could not be identified. In the earlier years bird remnants were identified at the BNHS by the then Research Assistant D. N. Mathew, and later on by Robert Grubh and others, to the extent possible under the then existing constraints.

However, with the launching of the Project "Ecological Study of Bird Hazards at Indian Aerodromes", funded by the Government of India in 1980, the BNHS investigated the possibility of identifying bird species even from a nondescript feather or a fragment. It was at this stage that RBG came across Brom & Buurma's (1979) and Brom's (1980) papers on microscopic identification of feathers. Brom's (1980) work was the first major contribution in this direction after the initial findings by Hargrave (1965) and Day (1966).

In 1982 October RBG spent a day at the Smithsonian Institution Natural History Museum (Bird section) with Roxie Laybourne who gave a detailed practical demonstration of the preparation of microscopic slides for identification of feathers.

The BNHS has adopted Brom & Buurma's method for feather identification since 1981. Using this method and the techniques (Ali and Grubh 1984 and Grubh and Ali 1984) we are able to narrow down the identification quite often to family or even generic level, further identification being effected by comparing with feathers of all species belonging to this genus or family from the BNHS reference collection. The research staff associated with feather identification since 1981 have been Lalitha Kupuswamy, Saraswathi Unnithan, S. M. Satheesan and the authors.

The Principle:

The microscopic structure of the feather barbules, particularly from the basal end of the vane, varies from one taxonomic group to another. The structural variations of barbules as explained by Brom (1984) are as follows:

1. Barbules may possess prongs.

2. Barbules are clearly subdivided into nodes and internodes (which are often pigmented).
3. Pigmented nodes can be heart-shaped, round or elongated and may have prongs of varying length.
4. Barbules show multiple nodes. The single nodes become loose and slide along the internodes to join the adjacent nodes. This process may be repeated till 8 to 10 nodes accumulate at one point.
5. Barbules may possess heart-shaped or round or elongated nodes only at the tips.
6. Nodes may decrease in size over a short distance.
7. Bases of barbules may possess villi (outgrowths).
8. The length of the barbules, the number of nodes as well as the internodal distance vary from group to group.

The photographs given here (see plates) show that it is possible to distinguish bird species from even a feather fragment (for detailed classification of bird taxa using this method see Brom (1980). So far the BNHS has identified almost all of the 125 odd bird remnants (having feather) sent to us for identification by IAF and the Civil Aviation. In all we have come across 46 bird species from these remnants (see Table 1).

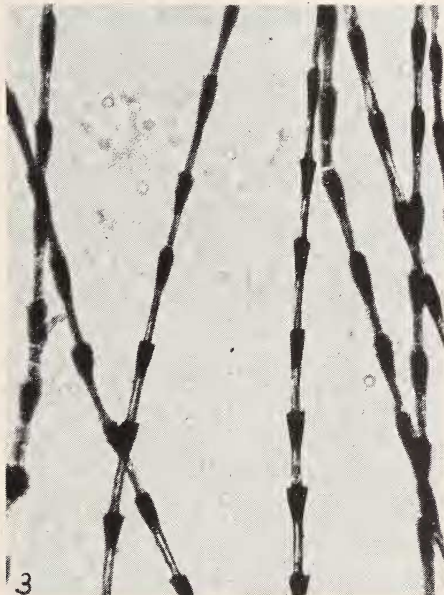
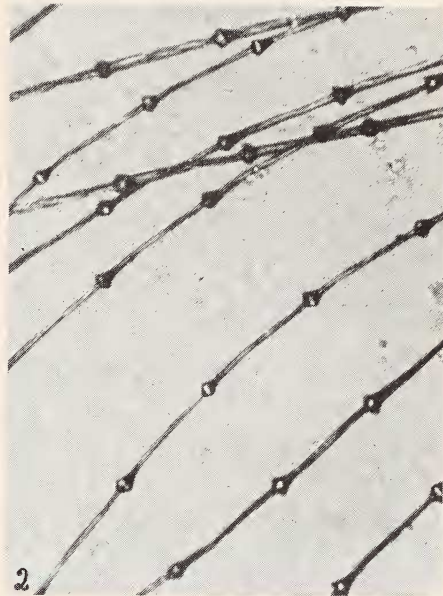
Before the BNHS started identifying bird-strike remnants, one had to depend mostly on visual identifications made on the spot by

TABLE 1

BIRD SPECIES IDENTIFIED FROM BIRD STRIKE REMNANTS (N. 125)

Species	Number of Remnant Samples
1. Pond Heron (<i>Ardeola grayii</i>)	1
2. Cattle Egret (<i>Bubulcus ibis</i>)	1
3. Blackwinged Kite (<i>Elanus caeruleus</i>)	1

Species	Number of Remnant Samples
4. Pariah Kite (<i>Milvus migrans</i>)	6
5. Brahminy Kite (<i>Haliastur indus</i>)	1
6. Longbilled Vulture (<i>Gyps indicus</i>)	6
7. Whitebacked Vulture (<i>Gyps bengalensis</i>)	29
8. Vulture (<i>Gyps</i> sp.)	4
9. Scavenger Vulture (<i>Neophron percnopterus</i>)	1
10. Hen Harrier (<i>Circus cyaneus</i>)	1
11. Short-toed Eagle (<i>Circaetus gallicus</i>)	2
12. Redheaded Merlin (<i>Falco chicquera</i>)	1
13. Kestrel (<i>Falco tinnunculus</i>)	1
14. Rain Quail (<i>Coturnix coromandelica</i>)	2
15. Painted Bush Quail (<i>Perdica erythrorhyncha</i>)	1
16. Common Peafowl (<i>Pavo cristatus</i>)	3
17. Demoiselle Crane (<i>Anthropoides virgo</i>)	1
18. Stone Curlew (<i>Burhinus oediconemus</i>)	1
19. Small Indian Pratincole (<i>Glareola lactea</i>)	1
20. Redwattled Lapwing (<i>Vanellus indicus</i>)	6
21. Yellow-wattled Lapwing (<i>Vanellus malabaricus</i>)	3
22. Sooty Tern (<i>Sterna fuscata</i>)	1
23. Indian Sandgrouse (<i>Pterocles exustus</i>)	1
24. Blue Rock Pigeon (<i>Columba livia</i>)	10
25. Indian Ring Dove (<i>Streptopelia decaocto</i>)	2
26. Spotted Dove (<i>Streptopelia chinensis</i>)	2
27. Little Brown Dove (<i>Streptopelia senegalensis</i>)	1
28. Roseringed Parakeet (<i>Psittacula krameri</i>)	1
29. Parakeet (<i>Psittacula</i> sp.)	1
30. Koel (<i>Eudynamys scolopacea</i>)	1
31. Swiftlet (<i>Collocalia</i> sp.)	1
32. House Swift (<i>Apus affinis</i>)	9
33. Palm Swift (<i>Cypsiurus parvus</i>)	4
34. Short-toed Lark (<i>Calandrella cinerea</i>)	2
35. Crested Lark (<i>Galerida cristata</i>)	1
36. House Swallow (<i>Hirundo tahitica</i>)	1
37. Indian Cliff Swallow (<i>Hirundo fluvicola</i>)	1
38. Redrumped Swallow (<i>Hirundo daurica</i>)	1
39. Rufousbacked Shrike (<i>Lanius schach</i>)	1
40. Starling (<i>Sturnus vulgaris</i>)	1
41. Common Myna (<i>Acridotheres tristis</i>)	1
42. House Crow (<i>Corvus splendens</i>)	4
43. Jungle crow (<i>Corvus macrorhynchos</i>)	1
44. House Sparrow (<i>Passer domesticus</i>)	1
45. Bat (Non bird) (<i>Pipistrellus mimus</i>)	2
46. Bat (Non bird) (<i>Taphozous</i> sp.)	1



1. A complete feather.

The following pictures are magnifications ($1 \times c. 300$) of loose barbules from the base of the feather from different species.

2. *Psittacula krameri*; 3. *Otus scops*; 4. *Acridotheres tristis*.